M|M

Stormwater Management Strategy Report

Baldwin Road, Traralgon

Prepared by: [redacted]
Millar | Merrigan

Metro 2/126 Merrindale Drive, Croydon Vic 3136
Phone 03 8720 9500 Fax 8720 9501
Regional 156 Commercial Road, Morwell Vic 3840
Phone 03 51348611

www.millarmerrigan.com.au

Table of Contents

List of Tables and Figures:

Document Status

Version	Date	Description	Prepared By	Approved By
5	01.04.25	FINAL	[redacted]	[redacted]
4	14.08.24	FINAL	[redacted]	[redacted]
3	17.03.21	FINAL	[redacted]	[redacted]
2	25.03.21	FINAL	[redacted]	[redacted]
1	17.03.21	FINAL	[redacted]	[redacted]

1.0 Introduction

Millar Merrigan Pty Ltd have been engaged by NBA Group Pty Ltd to prepare a stormwater management strategy for the Baldwin Road Development Plan Area. This report demonstrates how stormwater will be managed for the area, and forms part of the Baldwin Road Development Plan.

A previous stormwater management strategy report was undertaken by Millar Merrigan (MM) in support of the rezoning application "25950 Stormwater Management Strategy Report v3". A portion of the development plan area has now been successfully rezoned from Farming Zone (FZ) to General Residential Zone – Schedule 3 (GRZ3) allowing for the preparation of a development plan and ultimately residential development. The subject land now consists of FZ and GRZ3. It is proposed that residential lots will be provided on the GRZ3 and areas of the FZ will be utilised for stormwater treatment assets.

Schedule 11 to Clause 43.04 Development Plan Overlay (DPO) has been applied to the land. The DPO makes reference to the following items, which have been considered in this stormwater management strategy:

"The design and construction of stormwater drainage infrastructure including main drainage, wetlands, and retarding basins as described in the approved development plan.

The acquisition of land for stormwater drainage purposes in the proportions set out in the development contributions tables in the approved development plan."

This report provides a strategy for the internal arrangement of stormwater drainage assets and outlines how the development area will meet best practice pollutant reduction targets. This report also includes an assessment of the impact of the Latrobe River Flood Plain on the adjacent subject area.

1.1 Site Description & Context

The subject area is located 2.5km north-east of the Traralgon Township and approximately 170km south-east of Melbourne within the Latrobe Valley. The development plan area is situated within the Traralgon North Growth Area.

The proposed development is bounded by Traralgon North Development Area to the south and the Latrobe River Flood Plain to the north.

The relevant drainage authorities for the development plan area are West Gippsland Catchment Management Authority (WGCMA) and Latrobe City Council (LCC).

The existing condition of the subject area is primarily pasture historically used for grazing. Some existing water bodies are present, however, the area is generally free draining.

The topography is relatively flat and northern most extent of the development plan area is bounded by land subject to inundation from the Latrobe River.

Site geology is Haunted Hills Formation-fluvial deposits and generally consists of gravelly silt, silt and silty clay with moderate imperviousness.

Several assets, which are outlined in this report, have been or are soon to be constructed in the development plan area. This was due to the need to provide interim treatment and stormwater management solutions for the development stages to the south. The sediment basin and wetland in catchment 1 have been fully constructed and planted as part of the Franklin North Development. This includes an underground stormwater pipe, which was bored under the Esso pipeline easement and a stormwater conveyance channel down to the treatment assets.

Similarly, the sediment pond in Catchment 2 has been constructed as part of the Silverwood Development. The underground stormwater pipe, which conveys flow across the Esso pipeline is soon to be constructed.

Figure 1 overleaf shows the context of how Traralgon North Development Area fits in with the proposed development plan area.

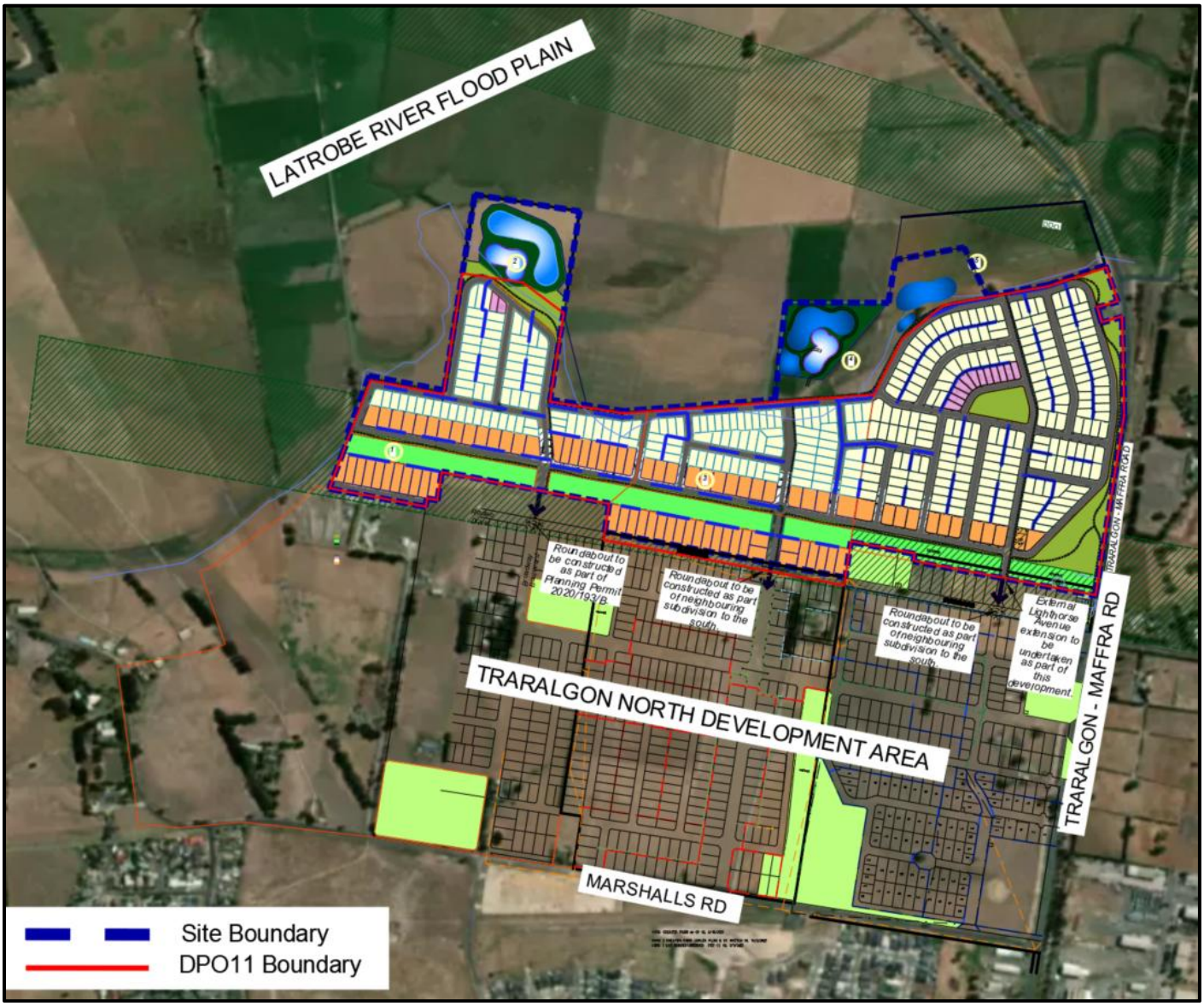

Figure 1: Baldwin Rd Development Area Context

2.0 Development Plan Proposal

The Baldwin Rd Development Plan proposes approximately 59 hectares of development includive of residential lots, roads, open space and drainage infrastructure. It provides for a variety of lot densities including standard density lots and a medium density housing site adjacent to the play space. Lots larger than 900m^2 are to front the Esso Pipeline easement as required by the Safety Management Study *("20-02-2024-PL-REP-001_SMS_Traralgon_Rev0_Signed"*).

There are 3 main road crossings over the Esso Pipeline, which allows for the safe conveyance of overland flows from the Traralgon North Development Area to the south. Similarly, 3 main roads provide for the overland flow running south to north through the subject area to the Latrobe River Flood Plan.

Underground stormwater drainage pipes will be provided in the road reserves of two of the abovementioned roads, which will cater for theoretical rainfall up to the 20% Annual Exceedance Probability (AEP).

The proposed development plan area sits within a broader catchment area as shown in Section 3 of this report. To treat flows from the subject area and from the Traralgon North Development Plan, it is proposed to provide 3 wetland and sediment pond systems north of the residential zones.

Figure 2: Flow Conveyance and Water Treatment General Arrangement

3.0 Drainage and Water Quality

3.1 Catchments

To provide a preliminary option for the layout of the stormwater drainage and to size the treatment assets for the development plan area it was required to evaluate and quantify the relevant stormwater catchments.

The proposed development comprises of three, predominately residential catchments, with pockets of reserve (Open Space) shown in Figure 3 below.

Stormwater exiting from The Rise Estate is treated to best practice, and therefore has not been included as a catchment requiring treatment in this report. Whereas flows from Silverwood, Franklin North and external flows from the south-west have been considered for treatment along with the development plan area.

Whilst The Rise Estate has been designed to limit stormwater exiting the development to predeveloped flows, the quantity of flow must be accounted for in the engineering hydrologic and hydraulic modelling to ensure that overland flows and underground drainage is sized appropriately within the Baldwin Road Development Area.

For a more comprehensive break down of catchments in terms of residential, open space, perviousness and imperviousness refer to Appendix A MUSIC modelling output and Section 3.3 of this report.

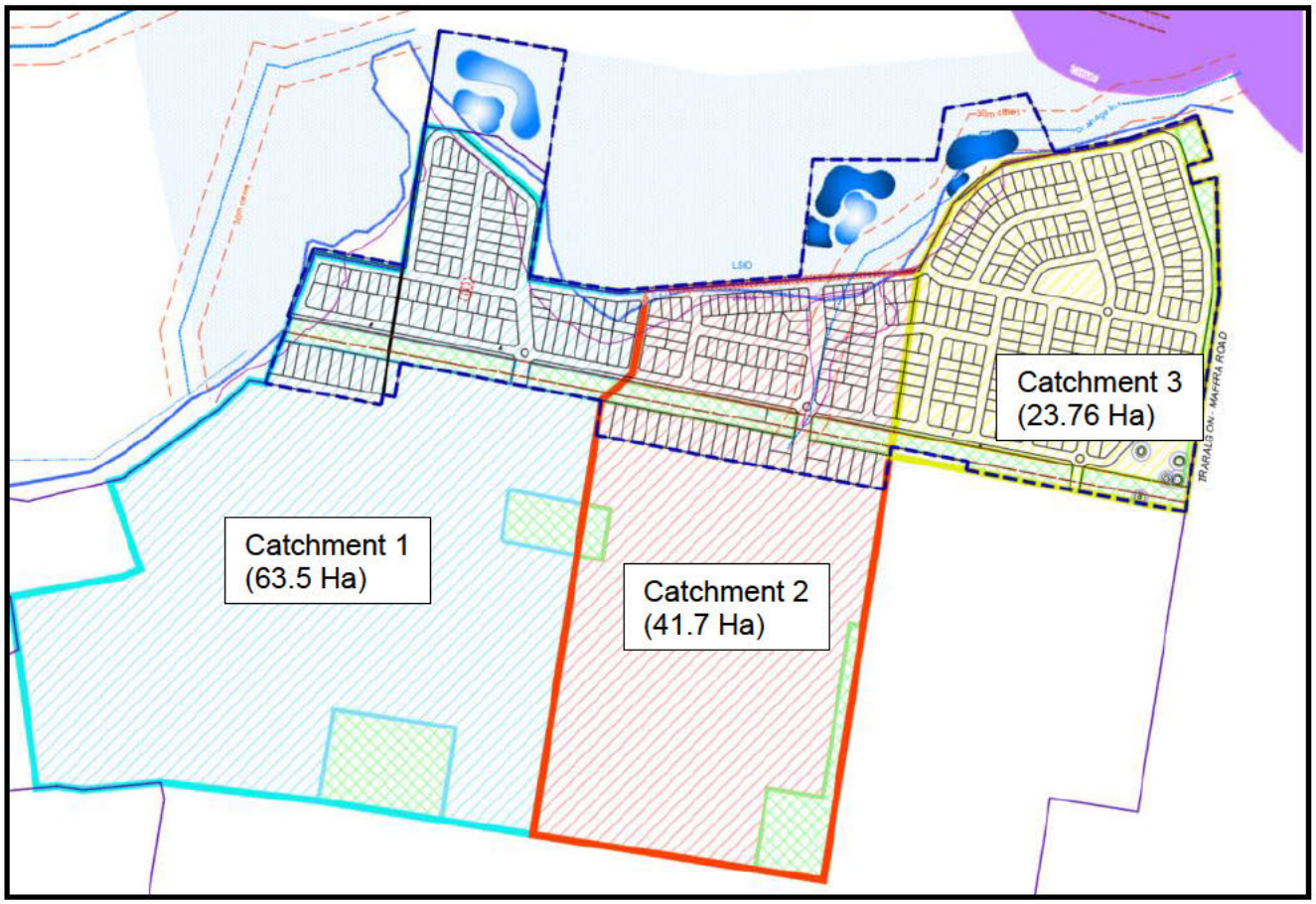

Figure 3: Catchment Plan

3.2 Drainage

The development plan area's topography generally falls to the north, towards the Latrobe River Flood Plain. It is proposed to adjust the topography in terms of cutting and filling to allow the sewer and drainage to function via gravity without the need for pumps.

A preliminary option for the layout of stormwater drainage is provided in Figure 4 below, which demonstrates how stormwater drainage can be managed. A combination of larger drains in the road reserve conveying higher flows to the treatment assets with smaller drains at the rear of lots within easements can be implemented to effectively manage the stormwater.

The underground drains will be sized to convey the theoretical 20% AEP rainfall event.
All rainfall events up to the 1% AEP will be catered for in the road reserves.
It can be seen in Figure 4 below that roads have been arranged to ensure that there is a clear and safe path for stormwater to travel overland south to north through the development plan area.

Figure 4: Drainage Arrangement Option

3.3 Water Treatment

A MUSIC model was undertaken to size the treatment basins for the development to meet best practice pollutant reduction targets. A summary is included below. For a comprehensive look at the MUSIC model input parameters refer to Appendix A.

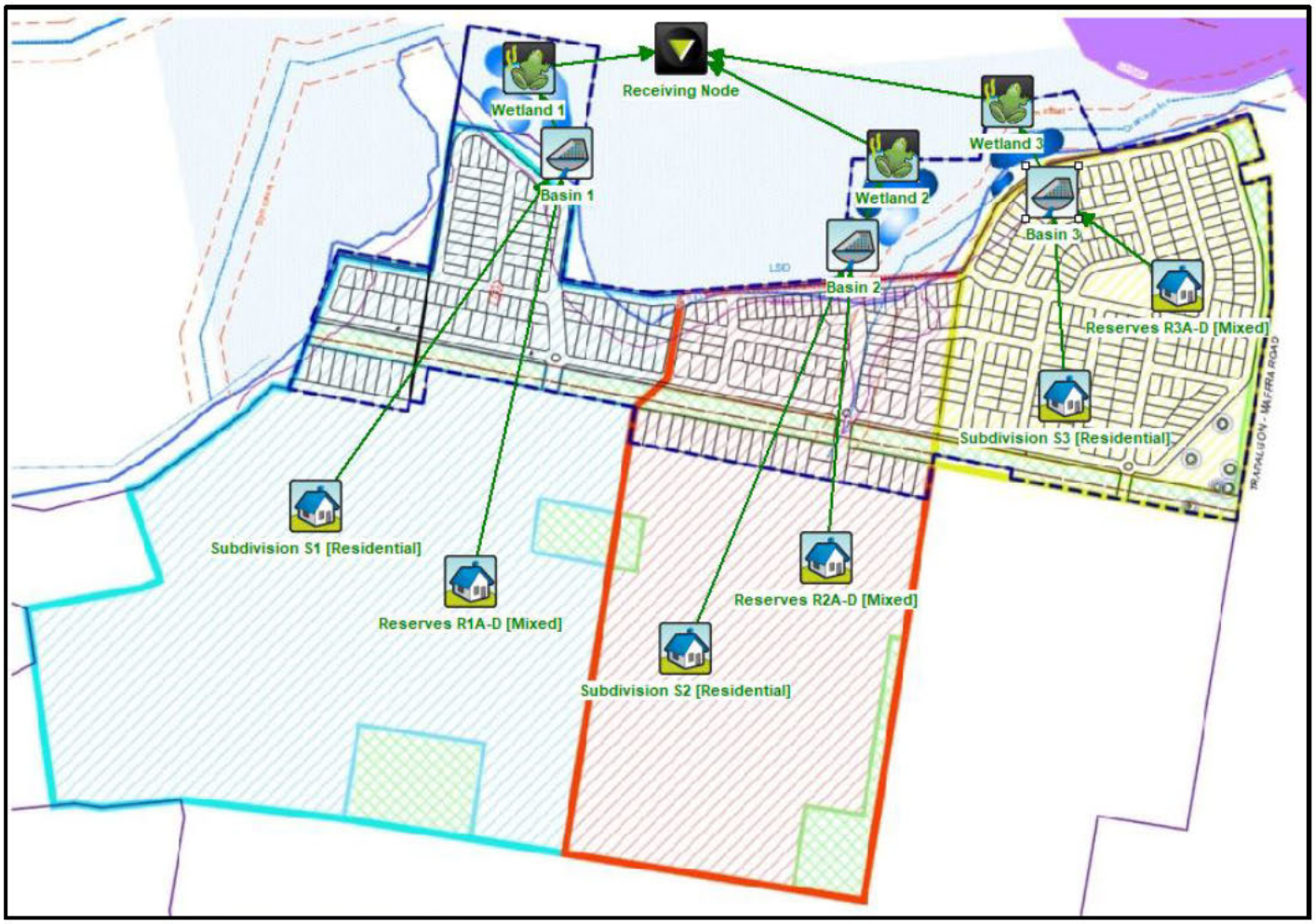

Figure 5: MUSIC Model

Each catchment of the development will direct stormwater to a sediment basin and wetland. The size of the treatment basins are shown in Table 1 below:

Table 1: Treatment Basin Sizing

Catchment	Treatment Type	Treatment Area (m^2)
Catchment 1	Wetland	10,000
	Sediment Basin	4950
Catchment 2	Wetland	4550
	Sediment Basin	2600
Catchment 3	Wetland	4400
	Sediment Basin	600

The pollutant reduction outcomes, which were achieved through use of the above treatment basins, are summarised in Table 2 below:

Table 2: Treatment Train Effectiveness

	Sources	Residual Load	% Reduction	Target %
Flow (ML/yr)	576	541	6.1	
Total Suspended Solids(kg/yr)	105000	8940	91.5	80
Total Phosphorus (kg/yr)	171	48.6	71.6	45
Total Nitrogen (kg/yr)	1270	695	45.3	45
Gross Pollutants (kg/yr)	24200	0	100	70

It can be seen that the proposed development exceeds industry best practice targets.

4.0 Flood Modelling

4.1 Introduction to Flood Modelling

Flood modelling was undertaken to determine the impact of the proposed development on the Latrobe River Flood Plain. This assessment was undertaken as part of the re-zoning process and has been accepted by WGCMA and LCC.

4.2 Existing Topography

Existing topography was modelled using LIDAR grid data.

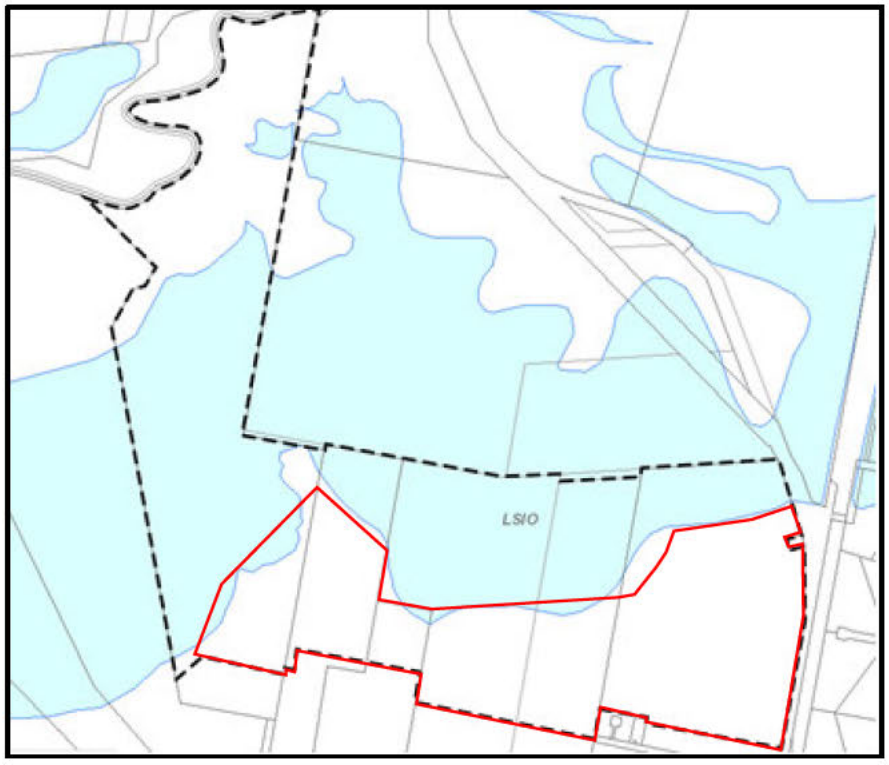

Figure 6: LSIO Boundary Relative to Proposed Development

The areas where the LSIO boundary extends within the proposed development can be viewed in Figure 6 above. It can be seen that the intrusion to the proposed development is relatively minimal. A discussion regarding to the accuracy and extent of the existing LSIO boundary is provided in Section 4.5 of this report.

The outcomes and recommendation of this report are not impacted by proposed amendment C131.

The terrain of the study area is shown in Figure 7 below:

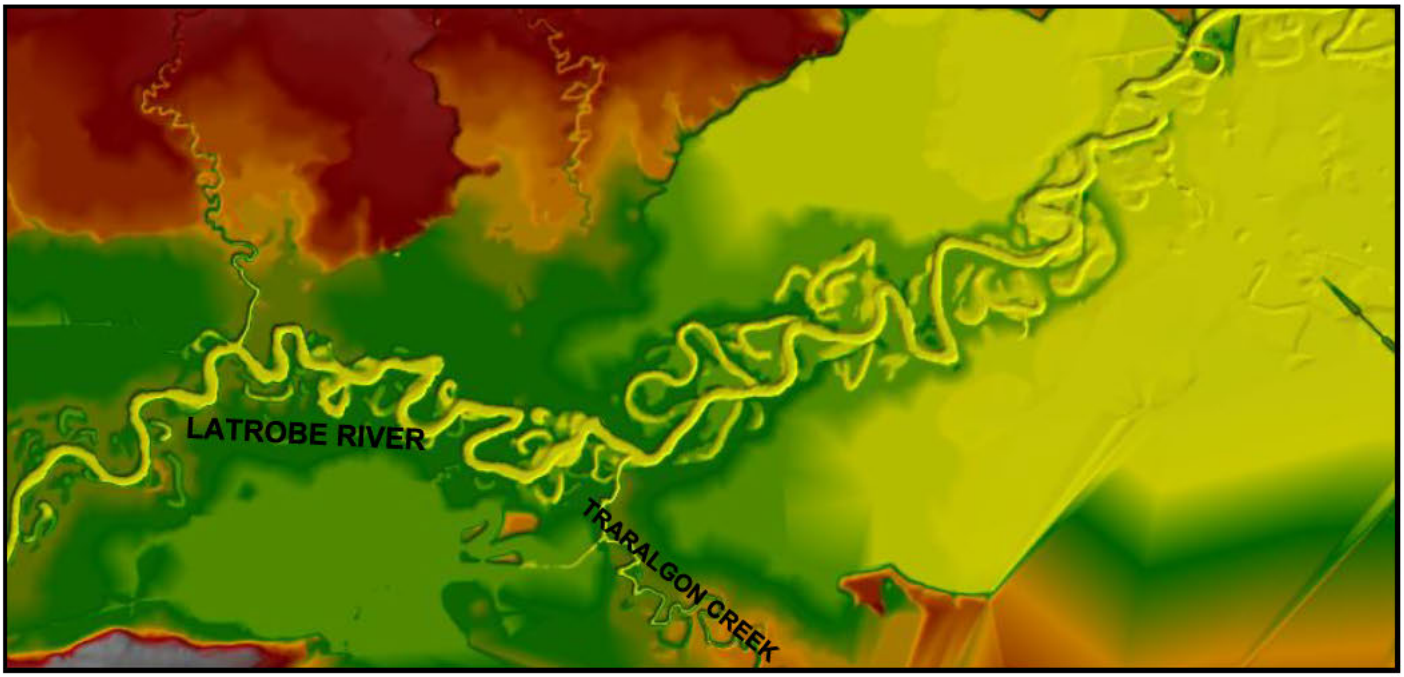

Figure 7: Existing Terrain

4.3 Hydrology

The hydrology of the study area was extracted from the Latrobe River Flood Study (LJ5792:RM2418), which was undertaken by Cardno in March 2015. This includes "Annex A hydrology Report" (LJ5792:RM2376), which contains the hydrographs, which were a basis of this hydraulic modelling.

To undertake the modelling, an inflow hydrograph was produced for both the Latrobe River and Traralgon Creek. This was completed by applying the shape of the hydrographs from the largest historical storm events recorded and adapting them to the peak flows determined in the Latrobe River Flood Study. Table 4 summarises the peak flows used to form the hydrographs.

Table 3: Peak Flows

Location	Historical Peak Flow	1% AEP Peak Flow
Latrobe River @ Thoms Bridge	825 m^3/s (1978)	1788 m^3/s
Traralgon Creek @ Prices Highway	230 m^3/s (1993)	330 m^3/s

The hydrographs can be viewed in Figure 8 below.

Figure 8: Inflow Hydrographs

A “rain on grid” inflow of 30mm/hour was also applied to each cell of the TUFLOW model as a conservative approach. This correlates with the 1% AEP for a 2 hour duration storm event for the local catchment. This was adapted from BOM IFD data.

Given that the upper limit peak flow for the Latrobe River was used to produce the hydrograph, the model contains two layers of conservatism.

4.4 Tuflow Model Setup

A TUFLOW model was set up within the computing software 12D.

A summary of the key modelling input data is provided in Table 4 below:

Table 4: TUFLOW Model Key Input Data

Parameter	Value	Unit
Cell Size	10	m
Manning's (n)	.035	
Storm Duration	72	Hours
Rainfall	30	mm/h
Mapping Depth Cutoff	.02	m

The hydrographs, which were previously discussed, were inserted into the model via 1d drainage nodes connected to the 2D surface tin.

10m cells were used in the TUFLOW model. This level of definition is adequate given the relatively large study area (1440 Hectares) creating 144,320 cells in total. The TUFLOW boundary extents spanned 4.5km in length and 3.2km width.

The topography of the study area is relatively undeveloped grasslands with basic farming activities. Therefore, a uniform Manning's value of .035 was deemed suitable.

4.5 Existing Conditions Model

TUFLOW was run using the existing terrain and the input data previously discussed. Figure 9 below shows the results of the existing conditions model.

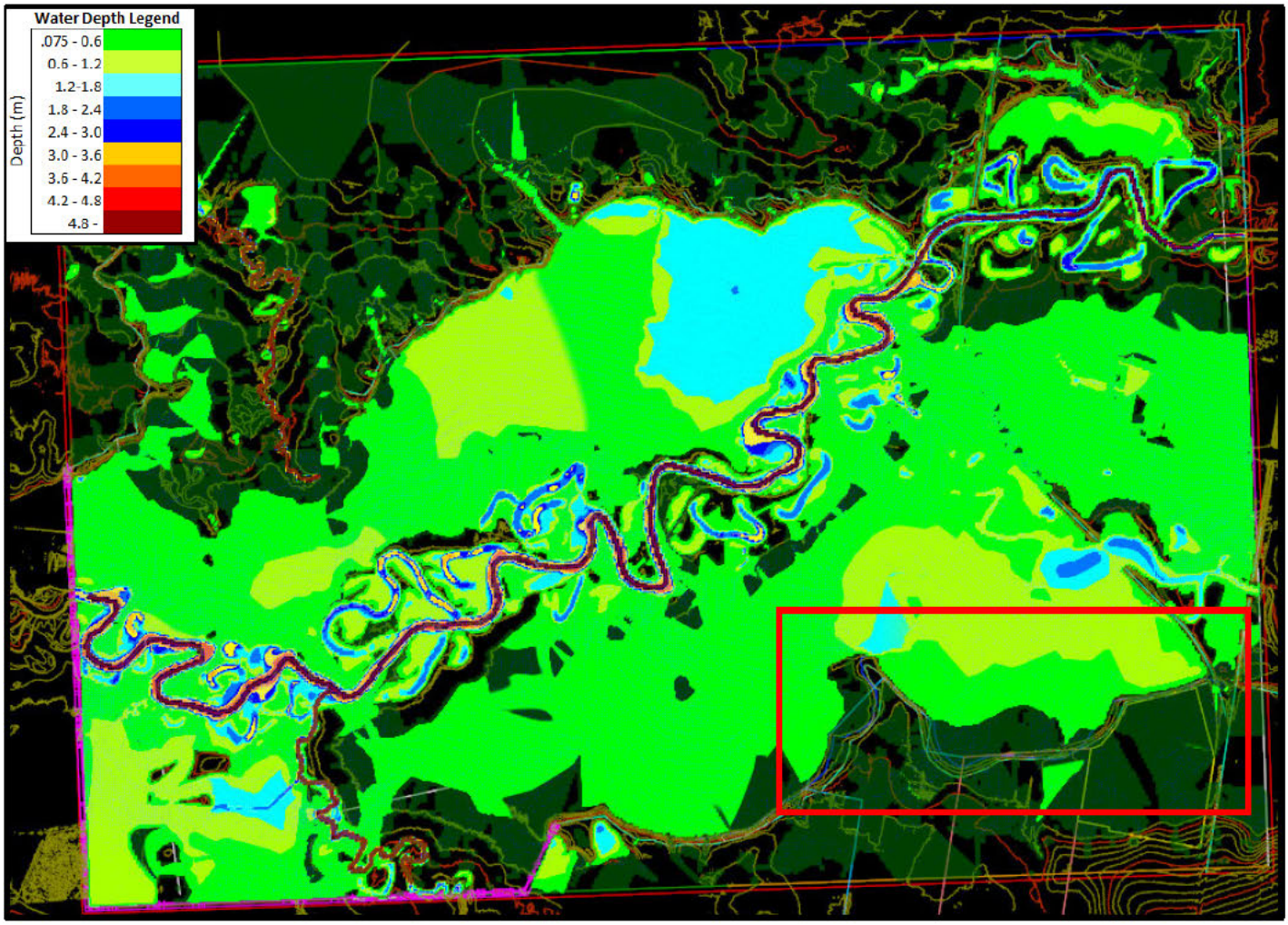

Figure 9: Existing TUFLOW Model Depth Results

Figure 9 overleaf contains a larger image of the area of interest, where the edge of the proposed development meets the Latrobe River Flood Plain.

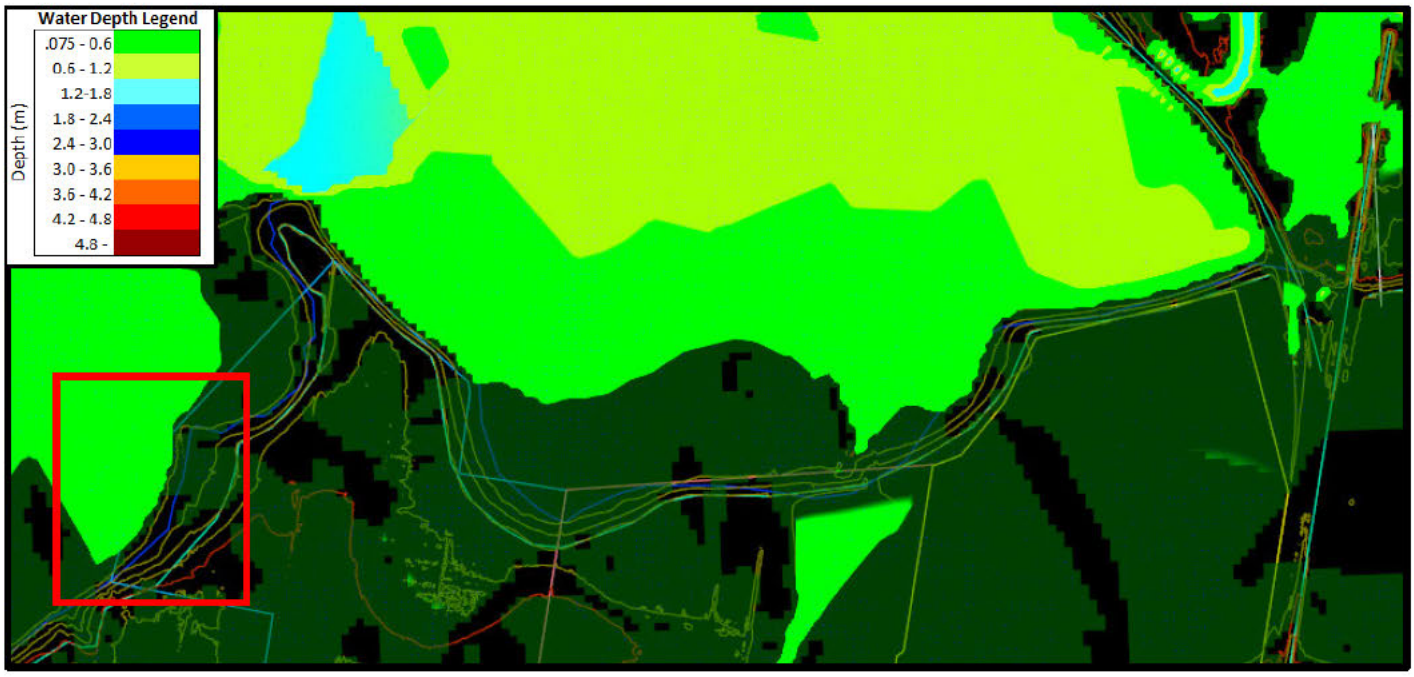

Figure 10: Existing TUFLOW Model Depth Results Enlargement

It can be seen from the above that the existing conditions flood model approximates the current LSIO boundary, however, some differences are apparent. In several locations the TUFLOW model shows the extent of the flood waters some distance from the LSIO Boundary despite the conservative nature of the model run. It is likely that the LSIO Boundary was drawn by tracing a contour in this location, rather than exactly matching the flood water extent.

It should be noted that despite the footprint of the proposed development extending beyond the LSIO in a number of locations, in only the highlighted area above does it protrude into the actual flood extent. And it does so marginally.

4.6 Developed Conditions Model

TUFLOW was run using the developed terrain and the input data previously discussed. LIDAR data was again used as a base for the existing topography with the proposed road and development being spliced in to create a 12D super-tin. Figure 11 below shows the results of the developed conditions model.

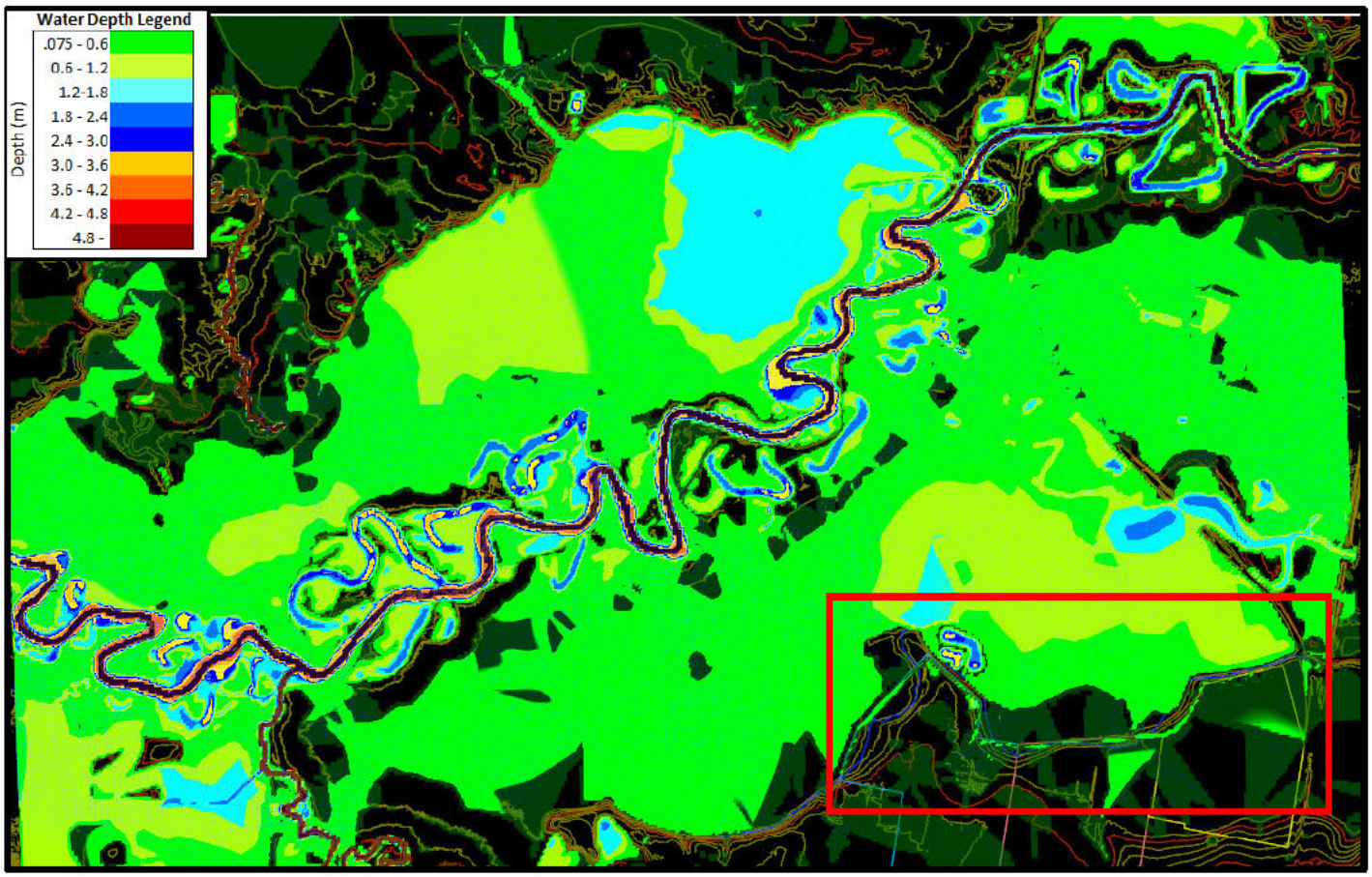

Figure 11: Developed TUFLOW Model Depth Results

Figure 12 overleaf contains a larger image of the area of interest, where the edge of the proposed development meets the Latrobe River Flood Plain.

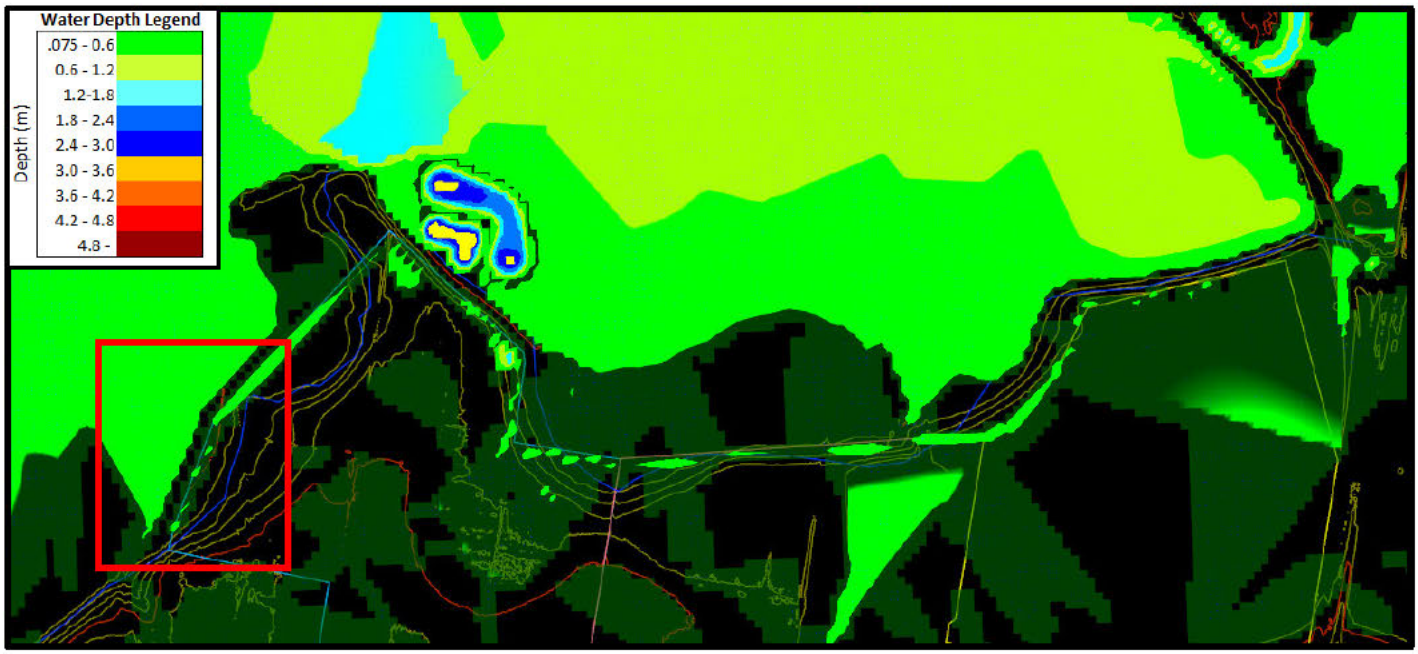

Figure 12: Developed TUFLOW Model Depth Results Enlargement

It can be seen from the above that the proposed development has no impact on the flood extent or flood water levels. This is as expected, given the vast area of the Latrobe River Flood Plain and the quantum of flows relative to the area the proposed development protrudes into the flood extent. Again, it is only the section highlighted in Figure 12, which extends into the flood waters.

Discussions were held with West Gippsland Catchment Management Authority and Latrobe City Council during the rezoning process. It was agreed that a reduction in the protrusion into the flood plain on the western side was preferred, which is now reflected in the development plan area. It was similarly agreed that along the northern boundary of the re-zoning that a straight road would be accepted despite a slight encroachment into the flood plain.

5.0 Conclusion & Discussion

A stormwater management strategy was undertaken to conceptually design the drainage, to size the subsequent treatment infrastructure required and to assess the impact of the development on the Latrobe River Flood Plain.

The development comprises of three residential catchments, which will all convey water to the North where the stormwater will be treated and eventually find its way into the Latrobe River Flood Plain.

A sediment basin and wetland will treat flows for all three catchments to exceed industry best practice pollutant reduction targets.

A TUFLOW model was undertaken to assess the impact of the proposed development on the Latrobe River Flood Plain.

Standard TUFLOW input parameters were used to produce a relatively accurate depiction of the existing conditions flood extents, conservatively using two separate inflow hydrographs with 30mm/hour rainfall. A high level analysis such as this would not typically include the rain on grid, however, it was the intention of the modelling to demonstrate the viability of the proposed development under the “worst case scenario”. Similarly, the hydrographs themselves were created using a conservative approach far exceeding any flows recorded.

The developed model was undertaken by modifying the terrain only and it can be concluded that the proposed development sits elevated above 1% AEP flood levels and does not negatively impact on the flood levels themselves.

Millar Merrigan engaged with WGCMA during the rezoning process and the extent of land, which was rezoned and the development plan area was informed by those discussions. Ultimately WGCMA and LCC consented to the concept at that stage and have provided consent for the LSIO being in the development plan area.

The outcomes and recommendation of this report are not impacted by proposed amendment C131.

All properties that are adjacent to the flood plain will be provided with a minimum floor level well above the 1% AEP rainfall event.

The proposed development will not reduce the storage of the flood plain and as demonstrated by the “worst case scenario” modelling approach the flood levels will not be negatively impacted. The slight encroachment into the flood plain is negligible, given the vast area and extensive volume of water in the large storm events. There will be a benefit to the flood plain via the proposed wetland and treatment systems, which offer some additional storage and pollutant reduction.

Appendix A – MUSIC Input & Results